

$$P_1 = \frac{5c^5 + 11c^4 + 26c^3 - 10c^2 + c - 1}{2c^{\frac{3}{2}}(c+1)^{\frac{3}{2}}(c-1)^{\frac{1}{2}}}, \quad P_2 = \frac{c^4 - 10c^3 + 2c^2 - 2c + 1}{c^{\frac{1}{2}}(c+1)^{\frac{3}{2}}(c-1)^{\frac{1}{2}}};$$

$$A_2 = u + \frac{5c^2 - 2c + 1}{c(c+1)^2}, \quad l = \frac{P}{5\sqrt{2}} + \frac{1}{2} \left(\frac{1}{C} - \frac{1}{A} \right) N;$$

$$B_1 = Qu + Q_1,$$

where

$$Q = \frac{(c+3)(c^2 - 4c - 1)}{2c^{\frac{3}{2}}(c+1)(c-1)^{\frac{1}{2}}}, \quad l' = \frac{Q}{5\sqrt{2}} - \frac{1}{2} \left(\frac{1}{C} - \frac{1}{A} \right) N,$$

$$Q_1 = -\frac{(c^2 - 4c - 1)(5c^2 + 2c + 1)}{2c^{\frac{3}{2}}(c+1)(c-1)^{\frac{3}{2}}}.$$

$$B_2 = u^2 - \frac{5c^3 + 19c^2 + 7c + 1}{c(c+1)^2(c-1)} u + \frac{-2c^3 + 22c^2 + 10c + 2}{(c+1)^2(c-1)^2}.$$

The same functions $\alpha, \beta, \gamma, \delta$, and their special algebraical forms are suitable for Kirchhoff's case of the motion of a solid in infinite liquid, but now V is a quartic function of u , requiring resolution into factors.

In the more general case invented by Clebsch, and developed in Halphen's "Fonctions elliptiques," t. II., the component rotation about OZ is no longer constant, and the solution is more complicated, introducing multiplicative elliptic functions to a parameter corresponding to the infinite value of u .

If the motion of the axis of the top is alone required, we take $\Lambda = \infty$, and investigate the function $\lambda = a/y$; this is a multiplicative elliptic function, with an effective parameter $a-b$, which can be made algebraical when $a-b$ is made an aliquot part of ω , irrespective of the separate terms a and b . By a further restriction, the exponential function of the time can be made to disappear by making $l + l' = 0$, and then H is at L in Fig. 1; it was in this way that the analysis was prepared of the algebraical cases, represented stereoscopically by Mr. T. I. Dewar, referred to on p. 199.

The authors say they have refrained from utilising these stereoscopic diagrams, because they would not like to assume in the reader the possession of a stereoscope. But our eyes should be drilled into control to pick up the solid appearance without any apparatus; a little quiet practice will suffice. Treatises on Solid Geometry of the future should be profusely illustrated with stereoscopic figures, which the student should see solid at will; and wall diagrams or lantern projections should also be drawn stereoscopically, and the solid effect obtained in the audience by crossing the two lines of sight.

Mr. T. I. Dewar's untimely death, at San Remo last May, has deprived us of any further diagrams from his skill, but the example he set will we trust be followed out completely in mathematical diagrammatic instruction.

The unsymmetrical top, discussed in V. § 9, leads into such great analytical complication, that only a few special degenerate cases have so far received any adequate attention; the next century will have its work cut out for the mathematical treatment of this problem and also of the dynamics of the bicycle. The symmetrical top of the boy, with the point free to wander over a smooth or rough horizontal plane, leads to similar analytical difficulties, and should be discussed in the same place.

On the other hand, the many attempts at a popular explanation of the motion of the top, restricted principally to the case of regular precession, are described in V. § 3. Prof. Perry's interesting little book on "Spinning Tops" comes in for praise, and the authors cite with pleasure the comparison of the top to a wilful beast (*eigensinniger thier*), always ready to move in some other direction to that in which it is pushed; insomuch that the Irishman can persuade his pig to accompany him on the road only by pretending that his way lies in the opposite direction; and so Bessemer's invention to steady the

motion of a cabin mounted on gimbals, by means of the controlling influence of gyrostats, was a failure.

If the authors are in search of other practical elementary illustrations, they should take the modern centrifugal machine, and examine the practical devices, as in the Weston machine, for controlling the nutations; these devices discovered experimentally without any assistance from theory will serve to elucidate the abstract formulas with advantage.

A third part of this book is still to appear, and we await it with great interest; the work when complete will form an indispensable book of reference for all who wish to make themselves thoroughly acquainted with this complicated problem in Dynamics.

A. G. GREENHILL.

NOTES.

AT Osborne, on Wednesday, August 2, the Queen conferred the honour of knighthood upon Sir William Henry Preece and Sir Michael Foster, Knight Commanders of the Order of the Bath, and invested them with the riband and badge of the Civil Division of the Second Class of the Order, and affixed the star to their left breasts.

THE Hanbury Gold Medal of the Pharmaceutical Society of Great Britain has been awarded to Prof. Albert Ladenburg, of Breslau, for his work on alkaloids and their derivatives.

MR. J. S. BUDGETT, of Trinity College, Cambridge, who accompanied Mr. Graham Kerr on his expedition in search of *Lepidosiren*, has been successful in obtaining eggs and larva of the Crossopterygian Ganoid *Polypterus*. From a short account of his investigations, illustrated by sketches, which Mr. Budgett has sent to this country, it appears that the larva is very minute, and possesses a "cement organ" on the dorsal surface of the head. Mr. Budgett is now on the journey home, and the full account of his work will be looked forward to with much interest.

ON a preceding page we have referred to some of the work performed by the Royal Gardens, Kew. Coincidently we have received the number for July 21 of our American contemporary *Science*, which contains an elaborate article by Prof. Underwood, headed "The Royal Botanic Gardens at Kew," in which the features of the garden and its position as a scientific institution—"its beautiful lawns, its delightful shade, its historic associations, its immense collections of cultivated plants, and its wonderful activity in the direction of botanical research"—are described and discussed with critical appreciation *apropos* the recent establishment of the Botanic Garden of New York and its capability to become "even more influential in democratic America than Kew has become throughout the length and breadth of the Queen's dominions." It is gratifying to have this acknowledgment of the work of Kew; and the tribute paid to the versatility and ability of Sir William Thiselton-Dyer in promoting its development and widening its influence will be everywhere endorsed. There are some blots on the escutcheon in the eyes of Prof. Underwood, but we imagine there are many who will not see with him in all the instances he mentions. The crowding of the museum collections he notes is an apparent blemish, and one we may hope to see removed by the provision of increased room for the exhibition of the specimens. A somewhat jealous comparison of Kew and Berlin as centres of botanical work is a jarring note in the article; and Prof. Underwood allows, we fear, German bias to weigh with him in making it, for instance, when he writes, "the principles of plant distribution are not so thoroughly grasped at Kew as they have been brought out at the German Botanical Garden through the skill of Prof. Engler and his associates." Yet Kew is the home of Sir Joseph Hooker!

FOR several years the need of greater facilities for the publication of mathematical investigations has been strongly felt by the members of the American Mathematical Society. This Society has maintained during the past eight years an historical and critical review, known as the *Bulletin* of the American Mathematical Society, and throughout the whole of this period there has been a constantly growing demand for the publication in the pages of that journal of articles not properly falling within its scope. The co-operation of several American colleges and universities was therefore recently invited in a plan whereby such articles may be afforded suitable means of publication. The necessary co-operation has now been secured, and the publication of a quarterly number of the *Transactions* of the American Mathematical Society has been definitely undertaken to begin January 1, 1900. The *Transactions* will be devoted primarily to research in pure and applied mathematics. The editors will welcome all papers containing investigations of sufficient mathematical interest and value. Such papers, in many cases, will be necessarily of considerable length; but the editors will be very glad to receive, also, short contributions which are of such a character as to fall within the scope of the *Transactions*. Papers from mathematicians not belonging to the Society will be welcomed; such papers, if accepted for publication, will be presented to the Society by the editors. Manuscripts intended for publication in the *Transactions* should be addressed either to Prof. E. H. Moore, University of Chicago, Chicago, Ill., or to Prof. E. W. Brown, Haverford College, Haverford, Pa., or to Prof. T. S. Fiske, Columbia University, New York, N.Y.

By the will of the late Dr. Jules Maringer, the Pasteur Institute at Paris is bequeathed the sum of one hundred thousand francs.

THE death is announced at Olten, Switzerland, of M. N. Rieggelbach, Correspondant of the Paris Academy of Sciences, in the Section of Mechanics.

Science announces the death of Mrs. Elizabeth Thompson, of Stamford, Conn., who made many gifts for benevolent and scientific purposes. She contributed towards the telescope for Vassar College, was one of three "patrons" of the American Association for the Advancement of Science, and endowed the Elizabeth Thompson Science Fund, the income of which is now being so advantageously used for the promotion of scientific research.

A REUTER despatch from St. Petersburg, dated August 2, says:—"News has been received here that the Russian members of the Russo-Swedish Scientific Expedition to Spitsbergen have arrived safely at Horn Sound, where they will winter. Later on they will proceed by land to the western side of the Stor Fiord, where they will engage in geodetic work. Some of the members will not remain over the winter, returning to St. Petersburg in October, but the others will stay in Spitsbergen until the autumn of next year. The Russian members of the expedition have not yet met with their Swedish colleagues; but Prof. Baklund has gone to meet them on board an ice-breaker."

REFERRING to the progress of vaccination, Mr. Chaplin said, in the House of Commons on Thursday last, that the returns which he had obtained showed that the total number of certificates of successful primary vaccination received by the vaccination officers during the first six months of the present year was 353,992 as against 277,821 in the first six months of 1898; that is to say, there has been an increase of upwards of 76,000 primary vaccinations or of more than 27 per cent. in the first six months of the present year as compared with the corresponding period of 1898. These results have been obtained in the first six months of the Act, notwithstanding the difficulty of

giving effect to an entire change of method throughout the country from stational to domiciliary vaccination; and also in spite of the fact that in numerous cases there was very considerable delay in the fixing of fees and the appointment of officers.

FROM a note in the *Times* we learn that the section of the famous mpundu tree at Chitambo's, which marked the place where Dr. Livingstone died, has been successfully removed by Mr. Codrington, the Deputy-Administrator of Northern Rhodesia, and will be sent to England for preservation. It will be remembered that two or three years ago Mr. Poulett Weatherley, while exploring in the neighbourhood of Lake Bangweolo, visited Chitambo's and reported that the mpundu tree was in an advanced stage of decay and would probably disappear altogether in a very short time. After careful consideration, the Royal Geographical Society decided that the best course to pursue would be to cut out the section of the tree which bears the inscription and have it sent over to London for preservation at the rooms of the Society. To mark the place where the tree stood, a large cairn has been erected with a staff made of two telegraph poles in the centre, held in place by stays of telegraph wire. This temporary memorial will serve the purpose of preserving the identity of Dr. Livingstone's deathplace until such time as a more permanent memorial is erected.

THE sixth international otological congress was opened on Tuesday at the Examination Hall, Victoria Embankment. Prof. U. Pritchard, the president-elect, was in the chair, and about three hundred aural surgeons from many parts of the world were present. In his presidential address, Prof. Pritchard traced the birth and growth of otological science. Although an ancient Egyptian papyrus had been found on which was written a monograph on deafness and ear diseases, otology, except perhaps with regard to its anatomy and physiology, did not make itself of great importance until the second half of the present century. Between 1840 and 1860 this branch of medical science was vigorously taken up by Sir William Wilde and Toynbee. Since then the means of diagnosis have been considerably improved, while in treatment there has been immense strides, due to the adoption of antiseptic surgery. At the commencement of the present century the ear was regarded almost as a *terra incognita*, scarcely worth consideration except as the seat of one affection only—that which was generally known as "a deafness"—now, at its close, this organ is fully-explored ground, and has been proved well worth the exploration. Otology has been raised from the rank of pseudo-quackery to an honourable position in scientific surgery, and its importance and bearing upon the body as a whole is now fully recognised.

THE results of experiments on the ignition of fire-damp and coal-dust by means of electricity were given in a paper by Herr Heise and Dr. Theim, recently read before the Institution of Mining Engineers. The object of the experiments was to determine to what extent electrically driven machinery is dangerous in fiery or dusty mines. In brief, the sum of the results obtained show that in general the amount of electrical energy which is capable in certain circumstances of igniting fire-damp need only be extremely small. This amount cannot be definitely fixed, however, as it depends not only on the quantity of energy but on the mode of its application and other attendant circumstances. It is only in the case of a current the conditions of which are exactly known that quantitative statements can be made as to the limits of safety for certain classes of transformation of energy. In any case, all visible sparks may be looked upon as dangerous. Experiment alone can decide whether certain classes of sparks

may be devoid of danger. Explosions of coal-dust alone appear to be impossible of production by electricity, unless indeed specially dangerous classes of coal-dust behave differently from those tried.

A COPY of a paper by Dr. J. S. Haldane, F.R.S., and Mr. F. G. Meachem, containing observations on the relation of underground temperature and spontaneous fires in the coal to oxidation and to the causes which favour it, has been received from the Institution of Mining Engineers. The conclusions to which the results of the investigations have led the authors are as follows: (1) A very large amount of heat, sufficient often (if not otherwise absorbed) to heat the air-current to boiling point, is always being formed in a mine, and this heat is almost entirely produced by oxidation of material in the mine. (2) The heat formed greatly exceeds in amount, as a rule, the heat withdrawn by the air-current, so that the temperature of the mine, or of some parts of it, is above that of the strata. (3) The disappearance of oxygen and liberation of heat in the mine are probably due, largely at least, to oxidation of iron pyrites; and the liberation of carbonic acid in the mine is probably due to the action on carbonates of the sulphuric acid thus formed. (4) Coal, when exposed to air, absorbs oxygen, and may also give off carbonic acid and fire-damp, and a very small amount of carbonic oxide. (5) The rate of absorption of oxygen by coal varies directly with the proportion of oxygen present in the air; and as the temperature of the coal increases in arithmetical progression the rate of oxygen-absorption increases in geometrical progression, the ratio of increase (for the coal experimented upon) being about 1/10 for every 4° Fahr. of increase in temperature.

THE engineering papers publish particulars of the series of trials made at Liverpool last week of self-propelled vehicles suitable for heavy traffic. The chief object of the trials was to encourage the development of types of heavy motor wagons suitable for trade and agricultural requirements. The trial runs were made from Liverpool, over distances of from thirty to forty miles, on two successive days. All vehicles were required to traverse the prescribed routes without alternative, and to perform other manœuvres. The distance between any two of the dépôts provided for the supply of water did not exceed twelve miles. Steam was used as the motive power in the six vehicles entered for competition this year. Oil was used for fuel in three, coal in two, and coke in one. Electricity and oil motors were unrepresented in the competition. The following awards were made by the judges:—In Class B, for vehicles having a minimum load, 2 tons; maximum tare, 2 tons; minimum level platform area, 50 square feet, a gold medal to the Steam Carriage and Wagon Company (Thorneycroft), Chiswick, and silver medals to Bayley's, Limited, and the Lancashire Steam Motor Company. In Class D, for vehicles with a minimum load of 6½ tons; maximum tare, 4 tons; minimum level platform area, 110 square feet, the gold medal was awarded to the Steam Carriage and Wagon Company (Thorneycroft).

A COMMITTEE of the British Association was appointed in 1896 to take any possible measures to secure uniformity in the pages of scientific transactions and serials, so that parts of various publications can be bound together by those interested in particular subjects. The Committee has already issued one report, and has since been taking steps to bring before the various societies which publish *Proceedings* and *Transactions* the advisability of bringing their publications into harmony, so far as size of paper is concerned, with the standard sizes which already prevail in a great majority of scientific journals and almost uniformly in the case of those longest established. As the result of the inquiries the Committee has issued a circular

giving the dimensions of the standard octavo and standard quarto size recommended for scientific publications. It is strongly recommended that every article should always begin at the top of a right-hand page, even if that involves a blank left-hand page, so that a paper can be extracted from a journal without mutilating one or two others.

THE Deutsche Seewarte has published a discussion of the storms experienced in the North Atlantic Ocean during the last week of January and the first weeks of February last. It will be remembered that it was during this exceptionally stormy period that the liners *Pavonia* and *Bulgaria* suffered so severely. The investigation shows that very unusual weather extended from the Rocky Mountains across the whole of the North Atlantic to the Ural Mountains, and that the storms over the British Islands and North-west Europe were accompanied by unusually high temperature, and blizzards occurred over the United States. The principal features of the storms were their great intensity and almost uninterrupted succession, and the period was characterised by the relatively southerly position of the zone in which the principal barometric minima occurred, and pursued the easterly direction in which they usually travel. The work has been prepared by Dr. E. Herrmann, and is illustrated by several charts. We understand that the Meteorological Council are also preparing for publication a more elaborate discussion of this stormy period.

THE Central Physical Observatory and the Geographical Society of St. Petersburg sent up an unmanned balloon on March 24, with duly verified meteorograph. The balloon started about 8 a.m.; in the course of an hour it had attained a height of 10 kilometres and was travelling at the rate of 75 kilometres an hour, according to photogrammetric observations made at Pavlovsk Observatory. The balloon was not found until May 9, 700 kilometres to the east of St. Petersburg. The instruments were in good condition, but the trace had suffered from exposure to the weather. The legible portion showed that at starting the temperature was -3°8 F.; at 3900 metres it had fallen to -29°6, at 4925 metres to -41°3, and at 6559 metres to -60°1; at 6878 metres the temperature was -62°9, while at the highest point shown by the curve, 7223 metres, the reading had risen to -61°4.

A REPORT on clock-rates and barometric pressure as illustrated by the mean-time clock and three chronometers at Mare's Island Observatory, together with a brief account of the observatory, is contributed to the *Publications* of the Astronomical Society of the Pacific, No. 68, by Ensign Everett Hayden, of the U.S. Navy. The paper is illustrated by a diagram of the barometer-rate curve of the mean-time clock, and from this and other tables it is inferred that the best chronometers show a remarkably regular change of rate for differences of pressure, running about 10s. faster for a decrease of 10-inch of mean barometer. It is suggested that the rate curves of such chronometers should be drawn for a mean pressure of 30°00 inches, with similar curves to the right and left for each tenth lower and higher pressures, respectively, for, say, five-tenths of an inch, for the practical use of navigators.

A LENGTHY paper on the influence of magnetism on the luminescence of gases has been contributed to the *Bulletin de la Classe des Sciences* of the Belgian Academy (part 6), by M. A. de Hemptinne. The author has studied the action of magnetism on tubes without electrodes excited by electric vibrations; and he examines in succession the influence of the pressure of the gas, the length of the electric wave, the nature of the gas, and the influence of the medium. The paper concludes with theoretical considerations relating to the observed facts.

PART 6 of the *Bulletin de la Classe des Sciences* of the Belgian Royal Academy contains a preliminary report from the Belgian Antarctic Expedition on the soundings of the *Belgica*, drawn up by M. Henryk Arctowsky. Between the channels of Tierra del Fuego and the archipelago of Dirck Gherrits a section was taken of the large Antarctic channel which separates the extremities of the Andes from the hypothetical Antarctic continent. Moreover, within the Antarctic circle and on the west of Alexander Land a series of soundings were taken while the ship was drifting with the pack ice. The principal bathymetric discoveries were (1) a deep flat-bottomed basin between the south side of the Andes and the mountain system forming the framework of the lands visited by the expedition; (2) in places a sharp declivity forming a demarcation to the continental plateau; (3) the existence of a continental plateau west of Alexander Land, and south of the 71st parallel.

FROM Dr. A. Goldhammer we have received copies of notes published by him in *Wiedemann's Annalen* 65 and 67, dealing, one with modern theories of electromagnetic phenomena in iron, nickel and cobalt, and the other with the Zeeman effect. In the former paper the author compares his equations with those obtained by Mr. J. G. Leathem, of Cambridge.

IN the *Journal de Physique* for June, M. Coloman de Szily investigates the effect of torsion on the electric resistance of wires. The substance used in the experiments was an alloy called "constantan," whose resistance is but slightly affected by changes of temperature. The general conclusions are: that torsion increases the electric resistance of a wire; that up to the limit of elasticity the increase is roughly proportional to the angle of torsion, but beyond that limit it increases more rapidly; and that the resistance of a twisted wire decreases slowly with the time.

IN *Cosmos*, No. 744, M. A. Acloque discusses the affinities between cadelis-flies and moths. The author considers that even if the distance between the Trichoptera and Lepidoptera is not great, there is at the same time a considerable gap separating them, and that little or no light on the question of a previous connection between the two orders is at present afforded by paleontological considerations.

DR. FELICE DELL' ACQUA, writing in the *Rendiconti del R. Istituto Lombardo*, brings forward considerations, both statistical and hygienic, relative to the consumption of meat food. It would appear that in Milan the average daily consumption of meat amounts to only 154½ grammes per head of population, and this the author considers is insufficient. After pointing out the desirability of paying greater attention to the diet, especially of working people, Dr. dell' Acqua discusses the beneficial effects of a fair proportion of meat on the general physique. The various ways of increasing the supply of meat are considered. Dr. dell' Acqua strongly urges the desirability of breeding more cattle in Italy, and of not slaughtering immature animals. Of other sources capable of yielding greater supply than at present, the author calls attention to fish, rabbits and birds, and he suggests the acclimatisation of foreign animals and even the use of horse-flesh. It would appear that in Italy considerably less animals are slaughtered for food in proportion to the population than in France or Germany, or especially England.

UNDER the title "The Honey Bee: a Manual of Instruction in Apiculture," by Mr. Frank Benton, the U.S. Department of Agriculture published a very useful *Bulletin* three or four years ago. Twenty-one thousand copies of the manual have been distributed; and the third edition, containing a few additions and

changes, has now been published. The magnitude of the aparian industry in the United States may be judged from the fact that more than 300,000 persons are engaged in the culture of bees, and the present annual value of aparian products is estimated at 4,000,000. Mr. Benton states, however, that the present existing flora of the United States could support ten times the number of colonies of bees it now supports. An advantage of this branch of agricultural industry is that it does not impoverish the soil in the least, but, on the contrary, results in better seed and fruit crops. For instance, Dr. L. O. Howard points out that recent investigations have shown that certain varieties of peas are nearly or quite sterile unless bees bring pollen from other distinct varieties for their complete cross fertilisation. Mr. Benton's treatise will continue to be of great assistance to persons engaged in the management of bees for profit.

IN the *Verhandlungen der k. k. geol. Reichsanstalt*, Nos. 6 and 7, 1899, Dr. M. Remeš deals with the question of palaeontological divisions in the Tithonian limestone of Stramberg. This limestone, as is well known, has yielded a varied and specially interesting assemblage of life-forms, including types of both jurassic and cretaceous character, and is to be looked upon as representing a true passage series. The author gives a brief account of the attempts that have been made to distinguish divisions of horizon or organic facies in the Stramberg Beds, and points out that insufficient care has hitherto been exercised in keeping separate the fossils collected from the various exposures in the one neighbourhood. With the results of his own studies as a groundwork, as well as the long experience of his father in the same field of observation, Dr. Remeš is enabled to show the character of the fauna collected from five different exposures, and to point out petrographical similarities and differences. He concludes that the Stramberg limestone forms a uniform mass which, while not satisfactorily showing stratification, permits a division according to facies in its different parts. It is found that a separation of the jurassic fauna with *Terebratula moravica* from the cretaceous fauna with *T. janitor*, as proposed by Hébert, cannot be justified; a mingling of jurassic and cretaceous forms occurs in like manner at all the points examined. The division adopted by Dr. Remeš, according to organic facies, is threefold. He distinguishes a cephalopod-facies (in the Kotouč-Schlossberg rock-complex), a coral- and sponge-facies (Gemeindesteinbruch complex), and an echinoderm-facies (in the red limestone of Nesselstorf). The passage of these single rock-masses into one another is stated to be gradual.

DR. TH. TCHISTOVITCH has made the toxic properties of eel-serum the basis of some important investigations on the mechanism of immunity. These researches emanate from the laboratories of Profs. Metchnikoff and Roux at the Paris Pasteur Institute, and are published in the *Annales*. Amongst other interesting facts brought to light is the discovery that during the process of immunising an animal against the toxic effect of eel-serum, although it may be trained to resist increasing quantities of the toxin, the *antitoxic* properties of this animal's blood-serum do not increase; on the contrary, the antitoxin of a greater or less degree of strength elaborated during the early stages of the immunising process steadily declines in antitoxic value as the animal gains in power of resisting the toxin. The presence, therefore, in the blood of an immunised animal of an antitoxin of a greater or less degree of strength cannot be held to furnish any information or standard as to the degree of immunity acquired by that animal. Immunity, therefore, depends not solely on the production of an antitoxin in the blood, but on some other mechanism which Dr. Tchistovitch considers may in all probability be dependent upon the leucocytes.

AN account of an investigation of a fungus which has done serious damage to the cacao industry in Trinidad is given in the *Kew Bulletin* (Nos. 145-146). Mr. J. H. Hart, Superintendent of the Royal Botanic Gardens, Trinidad, sent to Kew material for examination, and the report upon it states:—"Microscopic examination revealed the presence of two distinct fungous parasites, one being the well-known *Phytophthora omnivora*, De Bary, a species closely allied to *Phytophthora infestans*, De Bary, the cause of the potato disease; the other a *Nectria*, which proves to be new to science, and will be known as *Nectria Bainii*, the name suggested by Mr. Hart in compliment to Mr. Bain, who first called attention to the disease. The *Phytophthora* was present on all the pods sent, and may be considered as the cause of the present epidemic in Trinidad. The same, or a closely allied species, appears to be the cause of the cacao-pod disease in Ceylon. The *Nectria* appeared on two pods, and this again possesses many points in common with the *Nectria*, which has caused such destruction to cacao trees in Ceylon by attacking the bark of the trunk and branches, as described by Mr. J. B. Carruthers. At present no mention is made of other than the pod-disease in Trinidad, but the fact of a parasitic *Nectria* being present necessitates the prompt execution of measures calculated to prevent the parasite from extending its ravages." Mr. G. Massee describes each of the species, and states the measures which should be taken to combat the disease.

REPORTS on experiments on the manuring of oats, hay, and potatoes, and on the feeding of sheep, conducted in 1898 on farms in the centre and south-west of Scotland, are contained in the sixth annual report just issued by the agricultural department of the Glasgow and West of Scotland Technical College. The director of the experiments is Prof. R. Patrick Wright, and under his guidance a large amount of serviceable information, similar in character to that obtained at the Agricultural Experiment Stations in the United States, Canada, and elsewhere, has been made known. By a scheme framed by the Scotch Education Department, the Agricultural Department of the College referred to has been merged into the newly-formed West of Scotland Agricultural College; so the present report is the last of its series, though it is hoped that under the new college a considerable development of the scope and usefulness of the work of agricultural education and research will be rendered possible.

VOL. I. NO. 12, of the Records of the Botanical Survey of India is occupied by Mr. V. F. Brotherus' Contributions to the Bryological Flora of Southern India. A number of new species of moss are described.

THE first part of the second volume of the British Museum Catalogue of the African Plants collected by Dr. Friedrich Welwitsch, dealing chiefly with the mono cotyledons of the collection, by Dr. A. B. Rendle, has been published.

MESSRS. SWAN SONNENSCHEIN AND CO. have published a second impression of "An Introduction to the Study of Zoology" by Mr. B. Lindsay. The volume is intended for readers beginning the study of zoology, and its chief distinctive characteristic is said to rest "in its attempt to present the system of classification by grades in a form suited to the necessities of elementary and popular teaching."

THE number of the *Biologisches Centralblatt* for July 15 contains a very useful summary, by Prof. Moebius, of recent advances in our knowledge of the mode of impregnation in Gymnosperms and other flowering plants, derived from the remarkable observations of Webber, Ikeno, Hirasi, Nawaschin, Guignard, and Lotsy. The paper is illustrated by several figures.

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To the practical engineer Molesworth's "Pocket-book of Useful Formulae and Memoranda" is invaluable. The fact that the twenty-fourth edition, revised and enlarged, has just been published, indicates the extent to which the book has met with approbation. An entirely new electrical section has been added, and will increase the usefulness of what has long been a very serviceable manual.

Contributions from the Botanical Laboratory of the University of Philadelphia, Vol. ii. No. 1, is full of interesting papers. Dr. Lucy L. W. Wilson has some observations on the life-history of *Conopholis americana*, a remarkable American parasitic plant belonging to the Orobanchæ. Elizabeth A. Simons gives the results of a series of experiments on the rate of circumnutation of the growing stem of some flowering plants, which she finds to be considerably more rapid than the rate stated by Darwin. Mr. R. E. B. McKenney describes observations on the development of some embryo-sacs, chiefly *Scilla* and *Hyacinthus*. The present publication affords one among many illustrations of the extent to which scientific research is being carried out by ladies in the United States. Out of nine papers in this number, five are by women.

THE first number of the *Yorkshire Ramblers' Club Journal* is a very creditable production. Original contributions, reviews, illustrations, and reprints of articles which have appeared elsewhere are included, dealing with various phases of activity of the Club. Noteworthy among the subjects dealt with are the mountains and snow fields of Norway, and the caves and potholes of Yorkshire. A large number of the caves in the carboniferous limestone still remain unexplored; and the Club is busily engaged in this almost inexhaustible field of "underground mountaineering" and research. The manner in which the work of exploration has been carried on and the results achieved have already conferred distinction upon the Club, no less than on the members who are its pioneers. We shall look to future numbers of the *Journal* for particulars of new explorations.

SEVERAL publications containing the results of meteorological observations have lately come to hand. From Prof. J. M. Perner we have received vols. 32, 33-35 of the *Jahrbücher* of the K.K. Central-Anstalt für Meteorologie und Erdmagnetismus, Vienna, containing tabulated results of daily meteorological observations made in Austria during 1895, 1896 and 1898.—The *Jahrbuch* of meteorological observations made during 1897 at the observatory attached to the *Magdeburgische Zeitung*, edited by Herr R. Weidenhagen, has, in addition to the usual tables, a number of curves showing graphically some of the results.—The *Ergebnisse* of hourly observations made at Bremen in 1898, edited by Prof. Paul Bergholz, have been published.—Sir Cuthbert E. Peek has issued his annual statement of meteorological observations made at his observatory, Lyme Regis, during 1898. A special tower has been erected for the anemometers, and upon it are placed a Dines' pressure-tube recording anemometer and a Robinson anemometer, so that the two instruments can now be compared under very favourable conditions.

SEVERAL new editions of scientific works have lately been received. The publication, by Mr. Murray, of the third edition of Mr. Edward Whymper's guide to "The Valley of Zermatt and the Matterhorn" and the fourth edition of "Chamonix and the Range of Mont Blanc" is well-timed. All visitors to Switzerland should provide themselves with one or both of these interesting and serviceable handbooks.—A second edition of Prof. Henry Louis's "Handbook of Gold Milling" has been published by Messrs. Macmillan and Co. The book originally appeared in 1893, since which date great advances have been

made in the art of gold extraction. So far as possible, account has been taken of all important processes in bringing the book up to date.—Dr. David Walsh's volume on "The Röntgen Rays in Medical Work" (Bailière, Tindall, and Cox) contains much information of interest to all who desire to know how far Röntgen rays have been utilised in medical and surgical cases. To the physician and surgeon this second edition should be of great service in showing what has been done. Referring to the progress made since the publication of the first edition, Dr. Walsh says: "In practical work the times of exposure are shorter, results more certain, and the merits of the statical machine more widely recognised."—A second edition of "A Text-book of Applied Mechanics," by Prof. Andrew Jamieson, has been published by Messrs. Charles Griffin and Co., Ltd. This book has been revised and extended, the chief additions being in the part on hydraulics and hydraulic machines.—The case for cremation as a means of disposing of the dead is forcibly stated by Sir H. Thompson in "Modern Cremation" (Smith, Elder, and Co.), the third edition of which, revised and much enlarged, has just been published. The volume brings up to the present date the history of the practice of cremation, and of the work of the Cremation Society of England.

THE additions to the Zoological Society's Gardens during the past week include a Tantalus Monkey (*Cercopithecus tantalus*) from West Africa, presented by Mr. W. Knight; two Hairy Armadillos (*Dasypus villosus*), a Geoffroy's Cat (*Felis geoffrooi*) from La Plata, presented by Mr. W. Brown; a Magpie (*Pica rustica*), British, presented by Mr. S. B. Goldsmith; a Red-eared Bulbul (*Pycnonotus jocosus*), a Yellow-bellied Liothrix (*Liothrix lutea*) from India, presented by Miss Petrocchino; two Goshawks (*Astur palumbarius*), European, presented by M. P. A. Pichot; three Spotted Tinamous (*Northura maculosa*) from Buenos Ayres, four Rufous Tinamous (*Rhynchosciurus rufescens*) from Brazil, presented by Mr. Ernest Gibson; two Black-eared Marmosets (*Hapale penicillata*) from South-east Brazil, two Maholi Galagos (*Galago maholi*) from South Africa, a Sooty Phalanger (*Trichosaurus fuliginosus*) from Tasmania, a Malabar Squirrel (*Sciurus maximus*, var. *dealbatus*) from India, a Long-necked Chelodine (*Chelodina longicollis*) from South Australia, two Serrated Terrapins (*Chrysemys scripta*) from North America, deposited; a Grison (*Galictis vittata*) from South America, two Superb Tanagers (*Calliste fastuosa*), a Blue and Black Tanager (*Tanagrella cyanotis*) from Brazil, a Thick-billed Tanager (*Euphonia lanio*) from Central America, purchased; a Common Mynah (*Acridotheres tristis*) from India, received in exchange.

OUR ASTRONOMICAL COLUMN.

HOLMES' COMET, 1899 d (1892 III.).—A new ephemeris for this comet is given by Mr. H. J. Zwiers in *Astr. Nach.* (Bd. 150, No. 3582). It is important that as many observations as possible should be secured, in order to provide the necessary data for a more correct determination of the orbit.

Ephemeris for 12h. Greenwich Mean Time.

1899.	R.A.	Decl.	Br.	($r\Delta$) ² .
	h. m.	s.		
Aug. 10	2 43 48'80	.. 34 39 46"4		
11	44 56'27	.. 34 55 39"6		
12	46 2'64	.. 35 11 29"8	0.1940	0.04674
13	47 7'89	.. 35 27 16"9		
14	48 11'99	.. 35 43 0"9		
15	49 14'92	.. 35 58 41"7		
16	50 16'66	.. 36 14 19"2	0.1923	0.04781
17	2 51 17'17	.. 36 29 53"4		

COMET SWIFT (1899 a).—Observers still interested in this comet, and possessed of the necessary optical means, will find an extended ephemeris in the *Astr. Nach.* (Bd. 150, No. 3583).

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by Herr J. Möller, of Kiel. The positions and relative brightness are given up to September 16, but it is only with the largest instruments that the comet can be at all detected.

THE NEW ALGOL VARIABLE.—In *Harvard College Observatory Circular*, No. 44, Prof. E. C. Pickering gives an ephemeris for observations of this recently discovered variable. The following are the predicted minima during the nights of the present month:—

Heliocentric Minima of B.D. 45°3062.

1899, August 11, at 11h. 43m.
20, at 15h. 12m.

The position of the star is

R.A. ... 20h. 2'4m. } (1855),
Decl. ... + 45° 53' }

and its normal magnitude about 8.6.

DOUBLE STAR CATALOGUE.—Mr. R. G. Aitken has communicated to the *Astr. Nach.* (Bd. 150, Nos. 3584-5) his observations of 319 double stars made during the year 1898. The measures were made with the filar micrometer, in conjunction with either the 12-inch or 36-inch refractor, at the Lick Observatory. The star places are all reduced to epoch 1900, and the data given are time of observation, position angle, distance of components, and their individual magnitudes.

ELEMENTS OF COMETARY ORBITS.—M. G. Fayet has extended Oppolzer's "Traité des Orbites," and brought it up to date by giving the approximate elements for the year 1900 of all the comets hitherto observed. The list is divided into three portions, dealing with comets having elliptic, parabolic, and uncertain orbits respectively; 106 comets are given with elliptic elements, and 104 with parabolic elements, the dates of observation extending from 1702 to the present time. Fifty-one comets of uncertain elements are given, extending from 137 B.C. to 1880. This list of cometary elements will be especially useful in referring to the elements of any new comet, to see if it is really a new member of the solar system or a return of one previously recorded.

THE FUR-SEAL HERDS OF THE NORTH PACIFIC.

FEW commercial industries command a more varied or more widely spread series of interests than does the sealing trade of the North Pacific. In addition to the great biological interest attaching to the seal-herds, we have, first of all, a considerable number of Aleuts dwelling on the islands to drive, kill, and skin the seals, and who subsist to a certain extent on seal-flesh. Then there is the revenue drawn by the American and Russian Governments for the right of sealing on their respective islands, as well as the Customs dues levied by the former on the dressed seal-skins when re-imported into their territory. Not to mention the transport of the raw hides, the dressing of the latter and their conversion into commercial seal-skin forms a very important industry in London, which employs a large number of hands. There are, moreover, the vessels and their crews, which have of late years been engaged in pelagic sealing; a large proportion of which sailed from Canadian ports. Finally, there is the manufacture of the finished seal-skin into garments, and the retail sale of the latter.

From all points of view a cordial welcome should, therefore, be extended to the issue by the United States Government of the official Report of the Commissioner in charge of the fur-seal investigations of 1896-97. This Report, which bears the title of "The Fur-Seals and Fur-Seal Islands of the North Pacific Ocean," is in two parts, and comprises the final results of the investigations carried on by the Commissioner and his associates, as well as the recommendations jointly formulated by the American and British members of the International Commission.

The fur-seals of the Northern Pacific comprise three distinct herds, which are stated to keep strictly apart from one another, having each their own breeding-places, feeding-grounds, and routes of migration. The most important of the three herds is the one resorting for breeding purposes in summer to the islands of St. Paul and St. George in the Fribyloff group, situated on the eastern side of Bering Sea. In winter this herd